REMARKS

[0001]   The Office Action rejected Claims 1-22 under 35 U.S.C. §103(a) as being unpatentable over Bruno, et al (US Patent No. 5,999,963, hereinafter Bruno) in view of Rajkumar (U.S. Pat. Pub. No. 2003/0061260, hereinafter Rajkumar).

[0002]   The Applicants wish to traverse the rejection of Claims 1-22 under 35 U.S.C. §103(a). For the reasons set forth below, the Applicants respectfully request that the rejections be withdrawn and that the Claims 1-22 be allowed.

REJECTION OF CLAIMS 1-22 UNDER 35 U.S.C. §103(a)

[0003]   The Office Action rejected independent Claims 1, 8, 9, 16 and dependent Claims 2-7, 10-15, 17-22 under 35 USC §103(a) in view of Bruno and Rajkumar.

[0004]   Bruno and Rajkumar both teach methods of controlling high priority computer tasks using a preemptive model. In a preemptive multitasking environment, the operating system allows each task to run for a limited time-slice. When the time slice for a given task ends, the operating system suspends the task and allows another task to run. In a non-preemptive environment, each task runs until the task voluntarily gives up control.

[0005]   **Bruno.** Bruno generally teaches allocation of resources and scheduling of processes among competing processes using a preemptive scheduling model. Bruno, Col. 1, lines 10-12. Specifically, Bruno teaches that real-time processes may require Quality of Service (QOS) guarantees. Bruno, Col. 1, lines 38-42. Bruno introduces the concept of cumulative service which is a comparison of the total service provided to a process in a multi-process environment subject to interruption (i.e. preemption) compared with service the

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process would experience in an ideal system that is not subject to interruption. Bruno, Col. 2, lines 11-19. Bruno then teaches scheduling policies that include this cumulative service criterion. Thus, Bruno teaches preemptive multitasking specifically at Col. 10, lines 45-53.

[0006] **Rajkumar**. Rajkumar teaches a hybrid scheduling system for real-time tasks referred to as a reservation model. See Rajkumar ¶12. Rajkumar explains that the reservation is an assurance that a certain fraction of the system resources will be available to the task for a **particular** time period. Reference to a particular time period means that the time a task runs is subject to a certain limit. The task is preempted after that time period and may even be preempted before the time period expires so long as the task has used its consumption amount. See Rajkumar ¶¶25, 30. The consumption amount may be expressed in terms of time using a processor. "each reservation [is] allocated at least C units of usage time every T units of absolute time." See Rajkumar ¶56. The absolute end for the reservation time indicates that if the task has not completed by time T, the task will be interrupted/preempted. Hence, Rajkumar teaches a preemptive multitasking model.

[0007] To establish a *prima facie* case of obviousness, the combination of prior art references must teach or suggest all the claim limitations. MPEP §2142. In addition, "it is insufficient that the prior art disclosed the components of the patented device, either separately or used in other combinations; there must be some teaching, suggestion, or incentive to make the combination made by the inventor." *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 934 (Fed. Cir. 1990).

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[0008]   Applicants respectfully assert that Bruno and Rajkumar fail to teach or
disclose each element and limitation recited in independent Claim 1. Namely, Bruno and
Rajkumar fail to teach

1) **"calculating a suspension time** for said computer task based at least partially
on said throttle specification and said elapsed time" such that prior use of
system resources affects the rationing of future use of the same system
resource.

2) a non-preemptive "method for **self-throttling** the use of computer resources
by a computer task," wherein a computer task "receiv[es] … a throttle
specification" and "execute[s] … until a first unit of work is completed"

3) "suspending said computer task for said calculated suspension time…"

[0009]   Neither Bruno nor Rajkumar teaches a non-preemptive, self-throttling
method of controlling computer resources, teaches a method for self-throttling wherein the
rationing of future use depends on past use of resources by a task, or teaches an active
suspension of the suspended task. Although Rajkumar teaches a reservation system and
specifically a soft reservation, Rajkumar does not teach a method of rationing future use of a
resource based on prior use of the same resource. Applicants submit that these claimed
elements are absent from Bruno and Rajkumar.

[0010]   The Office Action submits that Bruno, alone, does not anticipate the
claimed invention because Bruno teaches a set quantum of time equal to or less than "Left."
See Bruno Col. 10, lines 39-40, 45-47, Last Office Action mailed December 12, 2005 page 3.
The Office Action points out that this bounded quantum leaves open the possibility that the

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task may be preempted, where the present invention does not teach preemption and instead teaches voluntary yielding of the system's resources.

[0011]   The Office Action proposes that Rajkumar solves the deficiency in Bruno by way of renewing soft reservations to allow for completion during a current scheduling interval. Applicants respectfully disagree with this characterization.

[0012]   Paragraphs 0055-0060 in Rajkumar explain a reservation process. In paragraph 57, a new consumption time C is allocated every T units of time. This means if C is used up prior to T units, the task must wait until T before C is replenished. Paragraph 60 teaches that a soft reservation can be scheduled again even if it is depleted. However, paragraph 60 also teaches that the soft reservation is still bounded by T. So any second or third runs of a soft reservation task must complete prior to T or else the soft reservation task will be preempted.

[0013]   Consequently, Rajkumar, like Bruno, suffers from the same deficiency of a bounded execution period during which preemption can occur. Preemption (time-sliced resource sharing) is clearly taught in Rajkumar in view of the fact that determinations 208 and 212 in Figure 4 are made based on the use of a consumption time or a general time interval.

[0014]   Therefore, because Bruno is bounded by "Left" and Rajkumar is bounded by T, neither Bruno nor Rajkumar teach or disclose nonpreemptive multitasking as recited in the claimed "method for self-throttling ...a computer task executing on a computer system."

[0015]   The Office Action asserts that Bruno teaches "a method of self-throttling the use of computer resources by a computer task." Under a system of "self-throttling," the

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throttling must be carried out by the entity that is being throttled. Although the references teach ways of scheduling a computer task, none of them teach a method whereby the computer task throttles itself. In the references, the system preempts the computer task; therefore the computer task is not throttling itself. "[E]xecuting said computer task until a first unit of work is completed read in light of the phrase "a method for self-throttling" clearly teaches a non-preemptive determination of execution. The task in Claim 1 determines when the first unit of work is complete.

[0016]   The present invention recites "calculating a suspension time ...based at least partially on said throttle specification and said elapsed time." The Examiner submits that this element is taught inherently in Bruno as a calculation of the total time that can be allocated to a process minus the service fraction time. The Examiner also characterizes the suspension time as the time allocated to other processes. See Last Office Action page 4.

[0017]   Applicants submit that the Examiner's proposals describe a period of time that is a natural extension of preemption based sharing models. In other words, because tasks are scheduled for a specific period of bounded time, T or Left, the tasks will naturally also have dormant time equal to the total time period minus T or Left. However, Applicants submit that this dormant time is NOT equivalent to the suspension time. This dormant time is not actively calculated in Bruno or Rajkumar. Furthermore, the dormant time in Bruno or Rajkumar is not fixed once it is calculated. If tasks are ready to run, the dormant task in Bruno or Rajkumar may be executed again, which interrupts the dormant time.

[0018]   Suspension time, as recited in Claim 1, is a calculated fixed amount of time that accounts for the elapsed time of a first unit of work and the throttle specification.

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See Claim 1. Furthermore, the suspension time is actively calculated in the present invention in part because the elapsed time can change for each unit of work.

[0019] Finally, Claim 1 recites "suspending said computer task" which is active suspension of a high priority task for the suspension time. In contrast, Bruno and Rajkumar teach non-active time under a preemptive model. In Bruno and Rajkumar tasks are not actively suspended for a suspension time. As mentioned, if the conditions are right in Bruno or Rajkumar, the same preempted task may be the next to execute (i.e. no "suspension" or dormant time). In the present invention, even if there were no other tasks to execute, the task remains suspended. The suspended task pays a penalty, the suspension time, based at least partially, on the elapsed time for a previous unit of work. Implementing an active suspension of the task ensures that system resources are available should new tasks become ready to run.

[0020] Bruno and Rajkumar fail to teach or disclose calculating of a suspension time based on past execution time, i.e. elapsed time. Applicants submit that suspension time is more than just the time tasks are dormant in a preemptive model such as Bruno or Rajkumar. Bruno and Rajkumar also fail to teach or disclose suspending of the task for the suspension time. Tasks in Bruno and Rajkumar may be inactive for a period of time, however, this time period can be interrupted if the resources become available. In the present invention, the suspension time is not interrupted. Bruno and Rajkumar fail to teach or disclose a nonpreemptive model for sharing resources between tasks. Therefore, Applicants submit that neither Bruno nor Rajkumar, either alone or in combination, teach all of the elements of Claim 1.

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Claim 7

[0021]   The Office Action rejected Claim 7 by asserting that Bruno teaches a computer task that self-throttles its resource usage. Applicants disagree. As explained above, Bruno teaches a preemption model in which the operating system controls resource usage. Dependent Claim 7 recites

> 7.   The method of Claim 1 wherein said computer task self-throttles the usage of said computer resources by said computer task in accordance · with said throttle specification.

[0022]   Dependent Claim 7 explicitly states that the "computer task self-throttles the usage of ... computer resources" in accordance with the arguments made above. This language is supported by the specification. (Taken from the published version of the present application, US 2003/0088605, hereinafter Beghtel) Beghtel, ¶¶23, 25, and 26. Nothing in either Bruno or Rajkumar suggests or teaches a self-throttling method of computer resource management. Instead, Bruno and Rajkumar teach an operating system that controls resource usage through preemption. In addition, self-throttling is not an obvious method of resource management and is not taught by either of the combined references. No motivation to combine exists since the individual elements, described in relation to Claim 1, do not exist in either reference.

[0023]   To establish a *prima facie* case of obviousness, the combination of the prior art references must teach or suggest all the claim limitations. MPEP §2142. As explained above, the non-trivial limitations found in Claim 1 of the present invention are missing from the cited references. If even one limitation is missing, then a §103(a)

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obviousness rejection is improper. Applicants respectfully submit that independent Claim 1 is patentably distinct and nonobvious over Bruno and Rajkumar. Furthermore, since neither Bruno nor Rajkumar teach or disclose calculation of a suspension time or active suspension of the computer task, non-preemptive self-throttling, and a rationing of a computer resource based on prior use of the same computer resource, there is no motivation to combine Bruno and Rajkumar.

[0024]   To establish *prima facie* obviousness, there must be some suggestion or motivation to modify the reference or to combine reference teachings to arrive at the claimed invention. "The teaching or suggestion to make the claimed combination ... must be found in the prior art, not in applicant's disclosure." MPEP 2143, citing *In re Vaeck,* 947 F.2d 488 (Fed. Cir. 1991). "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." *See* MPEP 2143.01 (emphasis in original), citing *In re Mills,* 916 F.2d 680 (Fed. Cir. 1990).
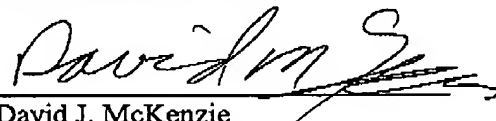
[0025]   As discussed above, Bruno teaches a method for allocation of resources and scheduling of processes among competing processes using a preemptive scheduling model the incorporates cumulative service criterion, and Rajkumar teaches a hybrid scheduling system referred to as a reservation model that includes preemption of executing tasks. However, neither reference teaches or discloses calculating of a suspension time, active suspension of the task, self-throttling the computer task's use of system resources according to the directions of the operating system, or the future rationing of computer resources based on the prior use of the same resources. In view of these facts, no motivation

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can be found to combine Bruno and Rajkumar for a method of self-throttling the use of computer resources by a computer task. *See* Claim 1.

[0026]   The Office Action rejected independent Claims 8, 9, and 16 under 35 USC §103(a) in view of Bruno and Rajkumar. However, Applicants respectfully submit that Claims 8, 9, and 16 cover substantially the same subject matter as Claim 1 discussed above. Claims 8, 9, and 16 also add additional limitations beyond those discussed in relation to Claim 1. Therefore, Claims 8, 9, and 16 should be allowed for at least the same reasons as Claim 1. Furthermore, since Claims 2-7, 10-15, and 17-22, which were also rejected under 35 USC §103(a) in view of Bruno and Rajkumar, depend from Claims 1, 8, 9, and 16 respectively, the Applicants respectfully submit that Claims 2-7, 10-15, and 17-22 are non-obvious for at least the same reasons as Claim 1.

[0027]   In view of the foregoing, Applicants submit that the application is in condition for allowance. In the event any questions or issues remain that can be resolved with a phone call, Applicants respectfully request that the Examiner initiate a telephone conference with the undersigned.

Respectfully submitted,

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